Threshold Concepts and the transformation of theory to practice: A designer's perspective.

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The anticipated outcome for the extensive investigation of Threshold Concepts is a modified curriculum design that better accommodates the teaching of these "conceptual portals", without which meaningful progress in the discipline is unattainable. Those researchers identifying and investigating the presence and nature of threshold concepts inevitably attain a heightened mastery of these knowledge structures and an arguably unique understanding of their impact on the student population. The subsequent task of harnessing this wealth of expertise and transforming it into meaningful teaching resources, particularly in fields such as science and engineering, often lends itself to the use of dynamic visualizations.
Instructional animations and videos are an ideal medium for visualizing complex information and are inherently amenable to extensive dissemination and uptake by other teaching institutions. However, the task of formulating a design blueprint that adequately reflects both the complexity of the threshold concept and the richness of the investigative processes undertaken by the academic is a formidable undertaking. The effective design of such teaching resources relies in part on the expertise of researchers and practitioners acquainted with the field of multimedia learning and accordingly the current report submits some pertinent recommendations and illustrative material for consideration.

1. **Adapting the current research findings in the field of multimedia learning**
   Educational psychologists have generated a wealth of empirically-based "cognitive design principles" to serve as guidelines for the creation of instructional multimedia (Mayer 2005). This enterprise has been accompanied by ongoing debates concerning levels of dynamism (Tversky et al 2002), interactivity (Lowe 2004) and prior knowledge (Kalyuga 2005). The findings have tended to be counter-intuitive at times in that animations are not inherently superior to static images and high levels of user interactivity may not lead to improved performance. Studies in the field have tended to be at the micro level and consideration will be given to how the findings could be extrapolated to more complex knowledge structures.

2. **A case study approach**
   An exemplar of best practice in the field of multimedia learning, designed by the authors (see http://www.animations.physics.unsw.edu.au/) , is examined in terms of its alignment to research-based principles and also to design considerations that pertain to threshold concepts, such as those raised by Land, Cousin, Meyer and Davies (2006). Of particular interest is how discipline-specific expertise can lead to innovative techniques that lie outside the precincts of the current literature in the field of multimedia learning (Hatsidimitris and Wolfe 2009).

Developing multimedia environments suited to complex knowledge structures is an objective that often requires close collaboration between a content expert and a multimedia designer who themselves are informed by research findings and guided by user feedback.

The Threshold Concepts community is well positioned to make the crowning contribution to this objective in so far as the ongoing identification and articulation of the "jewels of the curriculum" constitutes a promising blueprint for the academic-designer collaboration. However, unlike simpler knowledge structures that require minimal guidance by the content expert, the academic must acquire the skill and knowledge to partake in, and oversee, the complex decision-making process that underlies the design and construction of effective multimedia resources.

References:

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